(12) UK Patent Application (19) GB (11) 2 082 745 A

(21) Application No 8027649
(22) Date of filing 27 Aug 1980
(43) Application published
10 Mar 1982
(51) INT CL³
F21V 7/04
(52) Domestic classification
F4R 337 414 41Y 617 631
646 64Y CA
(56) Documents cited
GB 2065287A
GB 2061480A
GB 336773
(58) Field of search
F4R
(71) Applicant
Thorn EMI Limited,
Thorn House, Upper Saint
Martins Lane, London
WC2H 9ED
(72) Inventors
Alex Leopold Halberstadt,
John Albert Letchford
(74) Agent
R. G. Marsh,
Thorn EMI Patents
Limited, Blyth Road,
Hayes, Middlesex

(54) An Improved Reflector for Electric Projector Lamps

(57) In a lamp of the kind having a reflector and a light source permanently disposed at a precise position within the reflector, the reflector (1) is bowl shaped and has a reflective surface formed with part (3) of its surface area plain and the remainder (4) faceted, the plain and faceted regions comprising respective unitary bands extending circumferentially around said reflective surface with the faceted region disposed nearer than the plain region to the rim (5) of the reflector and with the surface area occupied by the plain region lying in the range from 35% to 65% of the area of the reflective surface of the reflector.

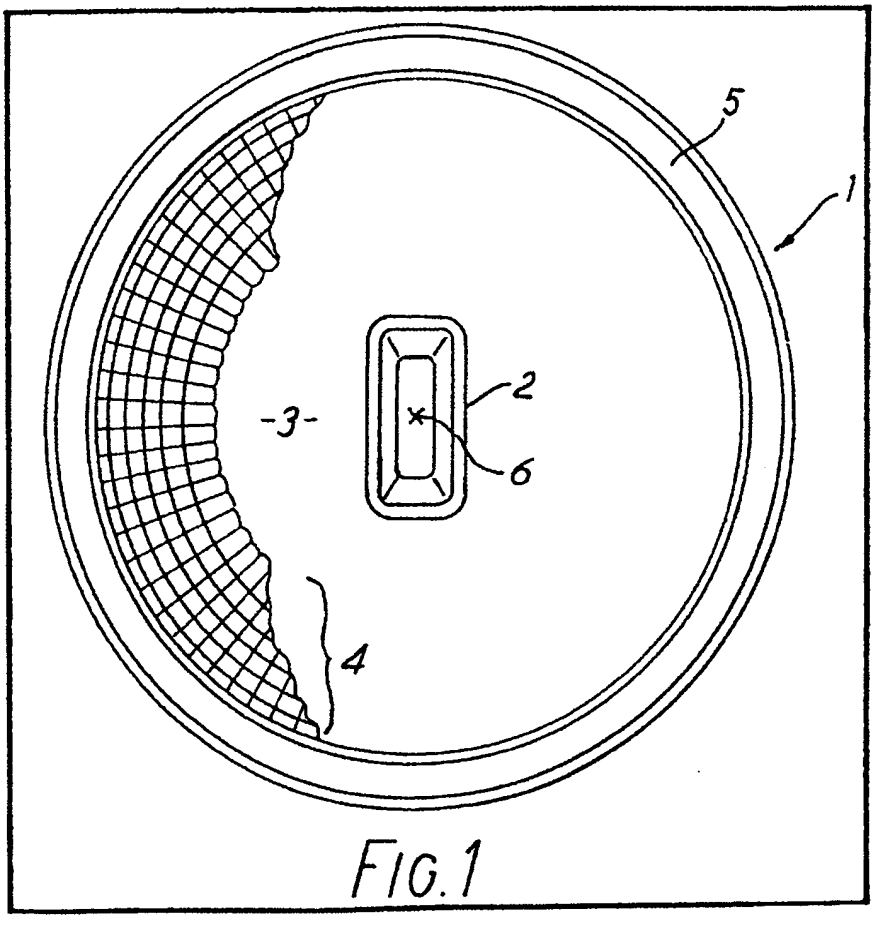

FIG. 1

GB 2 082 745 A

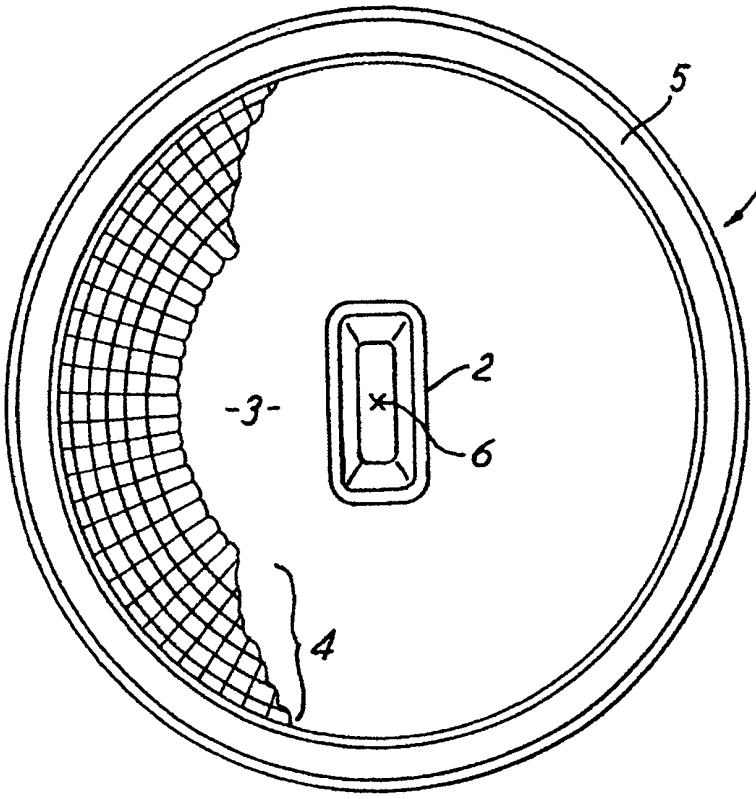

FIG.1

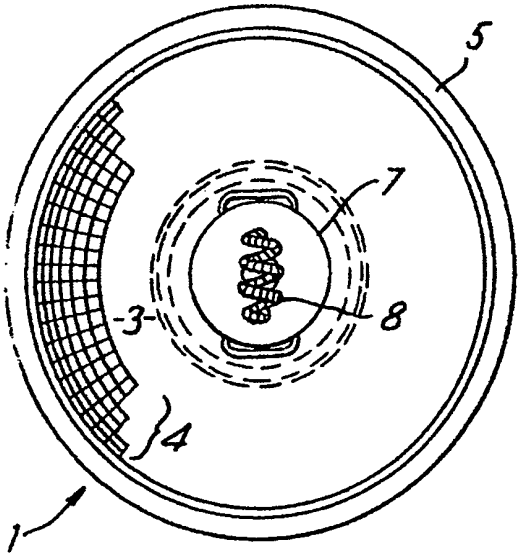

FIG.2(a)

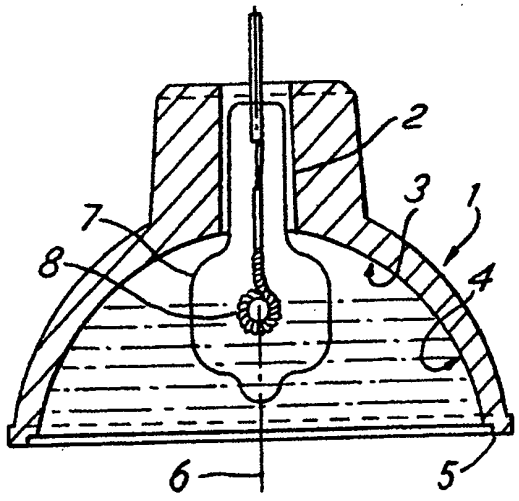

FIG.2(b)

SPECIFICATION

An Improved Electric Lamp

The present invention relates to electric lamps, and it relates more particularly to such lamps of the kind in which a light source is permanently and precisely located at a predetermined position within a generally dome-shaped reflector. Lamps of the kind just described will hereinafter be described as "lamps of the kind specified" and are typically used as projector lamps. It is usual, in lamps of the kind specified, for the light source to be constituted by an incandescent, helically wound filament and for the dome-shaped reflector to conform to a part-ellipsoidal curvature.

It is well known that, in the field of projector lamps, it is important that the projected light pattern does not contain an image, either of the filament (or other source of light) or of other structural parts of the lamp. One proposal for providing a projected light pattern that is free of such images is disclosed in United States Patent No. 4,021,659, which describes how the inner surface of the dome-shaped reflector of a lamp of the kind specified can be shaped in the form of a plurality of radial bands and a plurality of concentric circular bands to provide multiple facets, each of which may be flat or slightly curved and which together totally cover the reflecting surface of the reflector.

Another important factor in relation to projection lamps is that they should transmit as much as possible of the light emitted by the source into the associated optical system. The inventors have found that, in some circumstances, the use of a reflector surface totally covered with facets can reduce the amount of light passing through the optical system.

It is an object of this invention to produce a lamp of the kind specified which generates a light pattern substantially free of undesirable images of parts of the lamp without substantially reducing the light transmitted to an associated optical system, and to this end the reflective surface of the dome-shaped reflector is formed with part of its surface area plain and the remainder faceted, the plain and faceted regions comprising respective unitary bands extending circumferentially around said reflective surface with the faceted region disposed nearer than the plain region to the rim of the reflector and with the surface area occupied by the plain region lying in the range from 35% to 65% of the area of the reflective surface of the reflector.

In order that the invention may be clearly understood and readily carried into effect, one embodiment thereof will now be described, by way of example only, with reference to the accompanying drawings of which:—

Figure 1 shows, in front elevation, the reflector of a lamp in accordance with one example of the invention, with part only of the faceted region being illustrated, and

Figures 2(a) and 2(b) represent front elevational and cross-sectional views respectively of a lamp in accordance with one example of the invention.

Referring now to Figure 1, the dome-shaped reflector, actually of ellipsoidal configuration, is shown at 1. The reflective surface of the reflector 1 is formed with a centrally disposed, generally rectangular aperture 2, designed to accommodate a light source, and with respective unitary, circumferentially extending bands 3 and 4 that define regions of plain and faceted construction respectively. The faceted region is disposed nearer than the plain region to the rim 5 of the reflector 1 and the plain region occupies between 35% and 65% of the area of the reflective surface, with the remainder being occupied by the faceted region.

In one particular construction, the faceted region comprises six rings each of 72 facets, the circumferential extent of each facet being 5° and each facet being 2.56 mm in length measured along the reflective surface in the direction of the reflector's optical axis 6.

Figures 2(a) and 2(b) show the reflector 1 with its plain and faceted bands 3 and 4 respectively, and show how a light bulb 7 having a filament 8 can be disposed in the reflector. The filament 8 is coiled and extends transversely of the optical axis 6 of the lamp, the centre of the filament 8 being disposed at a focus of the ellipsoidal reflector 1.

It is believed that the effectiveness of lamps in accordance with this invention, both with regard to freedom from undesired images and to efficient light output, derives from the fact that the distance from the reflective surface to the filament is relatively small for points near the pole of the reflector compared with the corresponding distance for points near the reflector's rim. Thus the angle subtended by the filament tends to increase towards the pole, causing a corresponding increase in the divergence of beams of light reflected from the polar regions of the reflector as compared with the divergence associated with beams reflected from the rim. If the whole reflector surface is faceted, the divergence of beams reflected from all parts of the reflector is increased. However, for some optical systems and source size combinations, the divergence from the polar regions of a smooth reflector already produced sufficient divergence to fill the entrance pupil of a projection lens, for example, and any further divergence of the beam, as would be produced by facetting, is unnecessary and can result in a reduction of the amount of light passing through said entrance pupil. Thus the present invention provides for facetting near the rim, to give sufficient divergence to avoid the inclusion of undesired images in the light pattern generated by the lamp, and for a smooth reflective surface to be provided in the vicinity of the pole of the reflector to avoid excessive divergence which could reduce the light delivered to an entrance pupil.

It should be noted that combinations of faceted and non-faceted surfaces in dome-shaped

reflectors for lamps are disclosed in United States Patents Nos. 2,913,570 and 3,662,165. In the former patent, however, the facetting is provided in the polar region of a reflector, the rim region being plain, while in the latter patent the reflector surface is mainly facetted but a small region near the pole of the reflector is not, though it appears to be grooved. Neither patent discloses a lamp with a light source permanently and precisely located at a predetermined position within the reflector and, moreover, neither gives any guidance as to the ratio of the surface areas of the reflector to be occupied by the plain and faceted regions.

Claims

1. A lamp of the kind specified including a bowl shaped reflector formed with part of its surface area plain and the remainder faceted, the plain and faceted regions comprising respective unitary bands extending circumferentially around said reflective surface with the faceted region disposed nearer than the plain region to the rim of the reflector and with the surface occupied by the plain region lying in the range from 35% to 65% of the area of the reflective surface of the reflector.

2. A lamp according to Claim 1 in which the faceted region comprises a plurality of rings of facets.

3. A lamp according to Claim 2 in which the faceted region comprises six rings of facets.

4. A lamp according to any preceding claim in which there are 72 facets in each ring.

5. A lamp according to any preceding claim in which each facet is 2.56 mm in length measured along the reflective surface in the direction of the optical axis of the reflector.

6. A lamp according to any preceding claim in which the reflector is ellipsoidal at least in part.

7. An electric lamp including a bowl shaped reflector and an electric light source permanently located at a precisely defined position in relation to the reflector, wherein the reflective surface of the reflector is formed with part of its surface area having a plain and smooth reflective surface and the remaining area being faceted to increase divergence of light reflected therefrom, the plain and faceted regions comprising respective unitary bands extending circumferentially around said reflective surface with the faceted region disposed between the plain region and the rim of the reflector and with the surface area occupied by the plain region lying in the range from 35% to 65% of the area of the total reflective surface of the reflector.

8. An electric lamp substantially as herein described with reference to the accompanying drawings.

9. An electric lamp having an optical axis, a light source, means for positioning the light source at a precisely defined position on the optical axis, a bowl-shaped reflector having a reflective inner surface and means for positioning the reflector at a precisely defined position and symmetrically disposed about the optical axis with the light source disposed within the reflector, wherein the inner surface of the reflector is formed with two unitary annular regions, one region, closer to the optical axis than the other region having a plain smooth reflecting surface and the other region disposed further from the optical axis than the plain region being formed with a surface suitable to increase divergence, of light reflected therefrom, to a greater extent than the plain region and wherein the surface area occupied by the plain region is between 35% and 65% of the total reflective area of the inner surface of the reflector.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1982. Published by the Patent Office. 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.